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DOI: 10.2478/eces-2022-0028 ECOL CHEM ENG S. 2022;29(3):391-402

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RESEARCH ON RURAL ENVIRONMENTAL POLLUTION CONTROL PATH UNDER ADMINISTRATIVE INTERVENTION MECHANISM

Abstract: With the continuous development of urbanisation, the economic level of rural areas has improved greatly. However, due to the development of industry and the leap in the economy, the rural environment has suffered unprecedented damage. Taking Zhejiang Province as an example, this paper explores the rural environmental pollution control path under the government intervention mechanism. Firstly, it analyses the functions of the government in rural environmental pollution control. Then, taking Huzhou as an example, this paper empirically evaluates the willingness to pay for the treatment of living environment pollution in rural areas of Huzhou based on the CVM (Contingent Valuation Method) and analyses the decentralised domestic sewage treatment mode, multi household domestic sewage treatment mode, and waste collaborative treatment mode from the perspective of treatment technology and policy system. Finally, it is proposed that to speed up the governance of the rural environment, and we must strengthen the administrative intervention of the government in rural environmental governance. The government should improve the environmental protection awareness of leaders at all levels and the masses and enrich farmers' environmental governance knowledge and technical training. Based on the theory of environmental economics, agricultural economics, and decision-making behaviour, this paper analyses the influence mechanism of farmers' decision-making behaviour and government intervention in rural non-point source pollution control.

Keywords: ecological environment, conservation perspective, low carbon financial support, environment, Zhejiang Province

Introduction

With the accelerated development of urbanisation and agricultural modernisation, agricultural and environmental pollution control has become a very important task. Due to the lack of relevant laws and regulations and inadequate supervision, the problem of agricultural and environmental pollution is becoming more and more serious [1]. On the one hand, in the current agricultural production activities, chemical fertiliser has become the main input. Due to the low absorption efficiency of chemical fertiliser by crops, many chemical fertilisers flow into soil and water [2]. The excessive application of pesticides reduces the quality of agricultural products and brings serious toxicity to the agricultural environment [3].

On the other hand, the large-scale breeding of poultry has polluted the agricultural environment, such as wastewater and feces. Many enterprises and farmers directly discharge wastewater and feces into rivers and lakes to reduce costs, resulting in a decline

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in water quality [3]. Finally, the improper treatment of domestic waste by urban residents and the discharge of "three wastes" by enterprises are accelerating the pollution of the agricultural environment. The government has also attached great importance to the treatment of agricultural and environmental pollution, held working meetings on the treatment of agricultural and environmental pollution many times, and carried out the treatment of agricultural pollution in an all-round way. Academic circles have also held various types of special seminars to learn from and discuss with each other, hoping to find more effective ways and measures to solve agricultural and environmental pollution [4]. The government continues to strengthen the treatment of agricultural and environmental pollution, but the problem of agricultural and environmental pollution is becoming more and more serious [5]. The fundamental reason is the lack of systematic agricultural and environmental pollution control policies. Agricultural and environmental pollution control is one of the important current problems. With the continuous improvement of agricultural demand, the requirements for food safety are constantly strengthened, and the environmental pollution control of agriculture is required to be continuously improved [6]. From the system design perspective, this topic takes Zhejiang as the research object, hoping to design a set of institutional arrangements to control the current agricultural and environmental pollution in theory. From the perspective of cultural depth, controlling agricultural and environmental pollution is paying attention to constructing a modern ecological civilisation. Agriculture is the foundation of agriculture. Only by ensuring agricultural production can we build an ecological civilisation. The country's ecological civilisation construction is vigorously pushing forward, so agricultural ecological civilisation construction is even more important.

Administrative intervention refers to the super economical, administrative coercion of the state government agencies to the market, enterprises, and relevant economic activities by using administrative power under a market economy. Administrative intervention should be minimised but must be retained [7]. It is a special way for the state to manage the economy. However, the use of administrative intervention means must fully consider the interests of all aspects and must be carried out within the scope of a law [8].

The administrative intervention mechanism plays an important role in rural environmental pollution control in China. It not only helps to improve rural residents' participation in environmental pollution control but also helps to weaken social contradictions and promote the healthy development of rural environmental pollution control [9]. However, from the perspective of administrative management, rural environmental pollution control still faces some difficulties, such as unclear legal responsibility of administrative subjects, single relief methods for administrative damage, small scope of application of administrative management, and lack administrative procedures [10]. In this regard, to give full play to administrative management in rural environmental pollution control, all regions also need to clarify the legal responsibilities of administrative subjects and expand administrative damage relief methods and scientific design procedures. With the great stride of humanity towards the era of industrial civilisation, the degree of human pollution and damage to the ecological environment has far exceeded the regulation ability of the environment itself, which also poses a great threat to human survival [11]. From the economic perspective, the law of market value can dominate people's behaviour. Enterprises will ignore the pollution and impact on the external environment while pursuing the maximisation of interests. Based on this reality, if the government does not take necessary compulsory measures, it will make enterprises take

it for granted to discharge pollutants wantonly. Enterprises cannot invest funds in environmental protection [12]. It can be seen that the government must intervene in pollution control and environmental protection forcibly. Second, the government can not only effectively strengthen the sense of responsibility of enterprises and individuals but also comprehensively solve the problem of the source of funds for environmental protection [13]. With the intervention of administrative, economic, and legal means, the problems of environmental governance and protection have been comprehensively solved. During this period, the government is still responsible for protecting the ecology and controlling pollution [14].

Moreover, the civil, administrative, and criminal liabilities related to environmental pollution are also inseparable from protecting the government's macro forces. Third, different from general commodities, environmental factors and natural resources do not follow the general law of commodity circulation [15]. For example, the land transfer cannot be directly traded in the market but must comply with standard procedures and go through relevant procedures simultaneously. In this regard, the government must effectively use coercive means to manage and supervise the environmental factors and natural resource market to avoid market failure [16].

In developed countries, due to the rapid process of industrialisation, environmental problems appeared earlier than those in developing countries. Shen et al. [17] comprehensively studied the environmental problems in Europe and put forward a new view that multimedia will be a good measure of environmental management. To a certain extent, it will improve the efficiency of environmental management and change the environmental management mode from "top-down" to individual "bottom-up". Zhong et al. [18] studied the environmental problems brought by the development of urbanisation in Tanzania and analysed how it promoted environmental governance under the coordination of international environmental protection organisations. Shuai et al. [19] mentioned that the issue of environmental governance capacity in developing countries will attract more and more attention. He believes the gap between environmental policies and their achievements is also growing. The failure of government management policies is mainly due to the government's lack of the concept of environmental governance. China's rural environmental protection started late. Today's scholars do not have complete research results on the exploration of the function of the government in rural environmental governance and can only find clues in some relevant studies. Dyadik and Chapargina [20] analysed that there is still a lack of rural environmental legislation in China. There is no clear law to protect the agricultural environment. From the perspective of the existing legal system, it has been unable to meet the needs of today's rural social development. Alhassan et al. [21] proposed many reasons for rural environmental pollution. Not only should the government bear the responsibility of weak supervision, but enterprises and farmers should also bear the responsibility of indifference to the rural environment.

Taking the causes and current situation of household pollution as the starting point, this study comprehensively considers the cost and benefit of household pollution control measures and the feasibility of the technology, economy, and policy based on an empirical analysis of farmers' attitudes and willingness to control the aggravating degree of household environmental pollution, pollution control game and decision-making among farmers and foreign practical experience, Providing scientific decision-making basis for the government to formulate rural domestic pollution control has practical and theoretical significance for improving the theory and research methods of rural non-point source

pollution control and management in China. At the same time, a systematic study on the administrative intervention mechanism of the government in the process of rural environmental governance can promote the construction of a rural ecological environment and develop a harmonious society.

Methods and materials

The development of externality theory has experienced three stages: Marshall's "external economy", Pigou's "Pigou tax", and Coase's "Coase Theorem", which has been widely used in many practical activities such as environmental protection [22]. If the utility or production function of economic subject a includes some actual (non monetary) variables, when other subjects (such as individuals, companies and governments) consider the value relationship of economic subject A, if they ignore the impact of these variables on the welfare effect of economic subject A. If the activities of economic subject a affect the utility level of others or enter the production function of others, but do not pay (accept) for its activities in the form of compensation equal to the value of benefits to others, there is externality. Generally, we believe that without market exchange, the production behaviour of a production unit (or the consumption behaviour of consumers) affects the production process of other production units (or the living standards of other consumers). If the unit (or consumer) does not make an equal amount of compensation for this, externalities will occur.

Externalities can be divided into two types according to their functions. Among them, what is beneficial to the affected is called positive externality (external economy), that is, m benefit. What is unfavourable to the affected is called negative externality, that is, m damage.

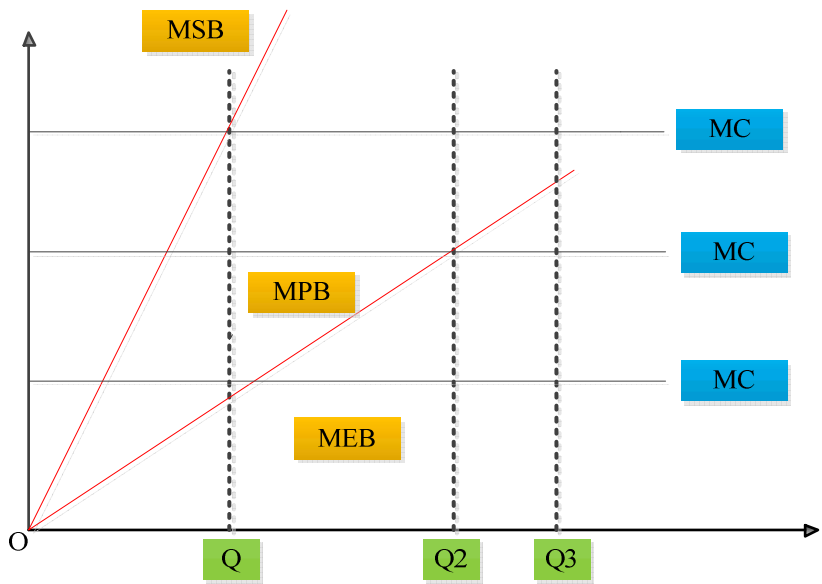

Fig. 1. External economy

As shown in Figure 1, the water environment quality of the surrounding areas is improved by the sewage treatment carried out by farmers. The marginal social benefit (MSB) is greater than the marginal private benefit (MPB), and the difference is the marginal environmental benefit (MEB), until Q2 MEB is zero. The behaviour of sewage treatment is determined by MPB and marginal cost (MC). When the price is marginal cost, the sewage treatment capacity Q1 < Q (effective capacity). In order to reach the sewage treatment capacity Q, the price must be reduced by NP, and compensation must be made to maintain external economy, otherwise it will lead to waste of resource allocation.

In order to promote farmers' pollution control, the government can implement corresponding compensation. Assuming that farmers adopt a sewage treatment facility, the original price is P1, and the government subsidises the facilities adopted by farmers.

The object of the subsidy is farmers, but its cost is applied to product facilities. Therefore, under the subsidy, the product output of manufacturers (facility providers) increases from Q1 to Q2, and the equilibrium price decreases from P1 to P2, as shown in Figure 2.

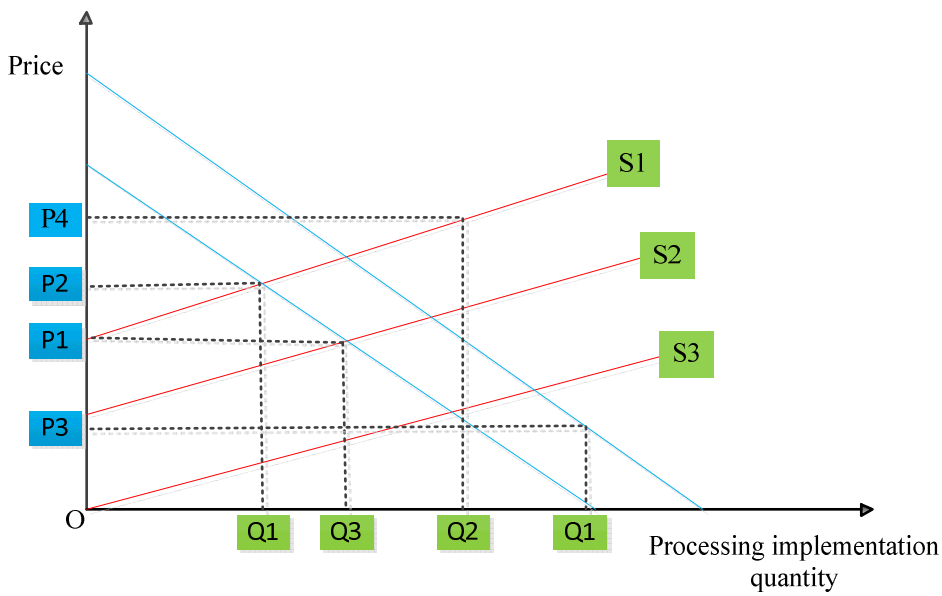

Fig. 2. Positive externality compensation effect on Farmers' pollution control

As shown in Figure 3, the marginal social cost (MSC) of littering is greater than the marginal private cost (MPC). Private littering is determined by its MPC and marginal benefit. At this time, the quantity is Q1. If it is to be reduced to the effective quantity Q, the littering penalty price must be increased to P1, otherwise it will lead to waste of resource allocation.

One of the main objectives of an environmental economy is to minimise and even eliminate external diseconomy. Therefore, for the pollution discharge behaviour of farmers' families, we must compensate for the external economic behaviour; on the contrary, we should punish it.

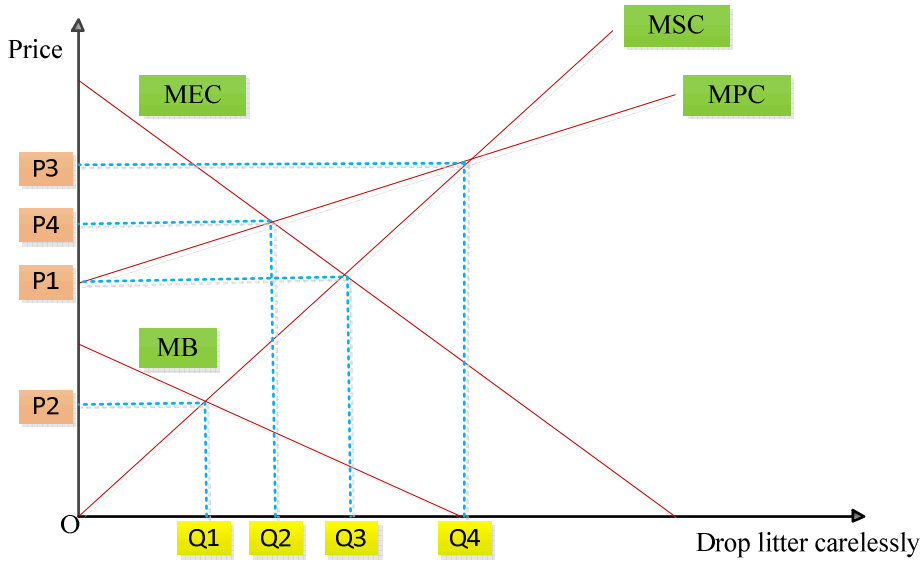

Fig. 3. External diseconomy

Generally speaking, the game can be divided into cooperative and non-cooperative games. The difference between a cooperative and non-cooperative game is whether there is a binding agreement between the interacting parties [23]. If there is, it is a cooperative game. If not, it is a non-cooperative game. From the time series of behaviour, game theory is further divided into the static game and dynamic game: static game refers to that in the game, participants choose at the same time, or although they do not choose at the same time, the latter actors do not know what specific actions the first mover has taken; dynamic game means that in the game, the actions of participants are in order, and the latter actor can observe the actions selected by the first actor. Popular understanding: "prisoner's dilemma" is simultaneous decision-making, which belongs to the static game. Chess and card games and other decisions or actions in order belong to dynamic games, which are divided into complete information games and incomplete information games according to the participants' understanding of other participants. The complete game means that in the game process, each participant has accurate information about other participants' characteristics, strategy space, and income function. An incomplete information game means that if the participants do not understand the characteristics, strategy space, and income function of other participants accurately or do not have accurate information about the characteristics, strategy space, and income function of all participants, the game, in this case, is an incomplete information game. The game theory that economists talk about generally refers to the non-cooperative game. Because cooperative game theory is more complex than non-cooperative game theory, its theoretical maturity is far less than non-cooperative game theory.

Due to the attribute of public goods, unclear property rights, and external diseconomy, the disorderly use of environmental resources exceeds the ability of environmental self-healing, resulting in the generation and deterioration of environmental pollution. In using the environment, various subjects influence each other in decision-making. They

should consider the decision-making of others and the maximisation of their utility. In governance, they should also consider the impact of other people's choices on themselves. Therefore, using game theory to analyse rural environmental pollution has practical significance.

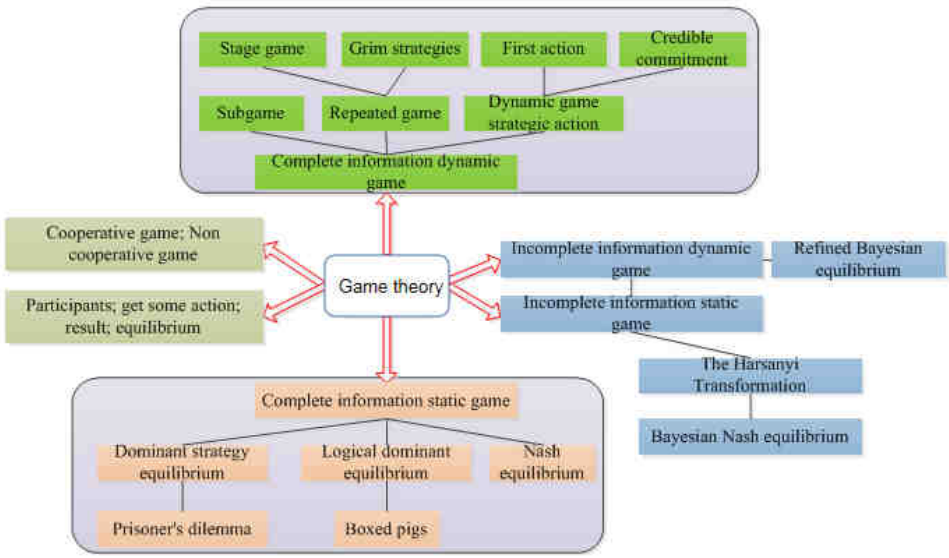

Fig. 4. Main components of game theory

Based on the review of relevant theories and research at home and abroad, taking the Huzhou area of Zhejiang Province as an example, this paper adopts the methods of literature research, field investigation, econometric model analysis, qualitative analysis, induction and deduction, comparative research, and so on. From the perspective of mathematical economics, this paper makes an economic analysis of farmers' pollution discharge and participation in pollution control. It empirically analyses the specific situation and causes of farmers' domestic pollution in the Huzhou area. The household emission of farmers is quantified, the willingness to pay is evaluated, and the decision-making behaviour of farmers is analysed from the perspective of game theory. On this basis, it is further proposed to improve laws and regulations, adopt cost sharing, subsidies and taxes, improve organisations and strengthen publicity and education. Policy suggestions such as enhancing the transparency and integrity of rural public information, giving full play to the enthusiasm of farmers and the common role of society. This study starts from two aspects: polluters reduce pollution, and managers improve effectiveness.

Farmers are not only the main body but also the recipient of rural domestic pollution. Improving farmers' understanding and understanding of pollution can give farmers the internal power to reduce pollution, and the improvement of the environment will further enhance the internal power. Pollution reduction and emission reduction should have both internal power and external power. Especially in the initial stage, external power guarantees and supports internal power. Due to the social characteristics of pollution, the government must formulate policies and systems as the management subject, and solidify them in the

form of law, to urge and encourage the reduction of pollution and emission reduction in rural areas.

Analysis of results

Chaozhou is north of Zhejiang Province, with a watered plain in the east and mountains and hills in the west. It is commonly known as "five mountains, one water, and four fields". It is the only city around Taihu Lake named after the lake. It is 80 km away from Hangzhou, 140 km away from Shanghai, and 220 km away from Nanjing. Huzhou has developed transportation, with north-south national highway 104, Hangzhou Nanjing Expressway, Xuanzhou Hangzhou railway, and east-west national highway 318.

(1) Deviation analysis of CVM

Contingent Valuation Method (CVM) is adopted for value evaluation [24]. Since it is through the hypothetical market, hypothetical deviation, information deviation, bidding starting point deviation, payment method deviation, strategy deviation, etc. may occur due to the design and investigation process.

(2) Determination of sample size

For random sampling survey, the following formula can be used to calculate the survey sample size, M:

$$M = \frac{\sqrt{x^2 \cdot d^2}}{\sum_{i=1} \beta^2} \tag{1}$$

where: x - the x-statistic of letter level is 1.24 at 95 % letter level; β - the overall standard deviation is generally taken as 0.5; d - survey error, 5 % in this paper.

(3) Research content

For this study, the variables are divided into three parts: Individual socio-economic attributes and cognitive status: gender, age, education level, monthly income, understanding of environmental knowledge, and effectiveness of pollution control are introduced, respectively; Sewage treatment facilities and treatment methods: sewage treatment facilities, garbage treatment facilities, sewage treatment methods, and garbage treatment methods are introduced; Relevant policies and measures: from the implementation status and effect of policies and measures, government supervision, government subsidies and publicity and education of environmental protection regulations are introduced, as shown in Table 1.

Table 1

Explanatory significance of variables

Variable interpretation	Variable code [-]	Variable definitions and units [-]
Gender	Y1	Dummy variable, *man* = 1, *woman* = 2
Age	Y2	Continuous variable, 10-80
Education level	Y3	Continuous variable, 0-6
Monthly income	Y4	Continuous variable, 1-6
Sewage treatment facilities	Y5	Dummy variable, *nothing* = 0, *yes* = 1
Government supervision	Y6	Continuous variable, 0-6
Government subsidies	Y7	Dummy variable, *no* = 0, *yes* = 1
Effectiveness of pollution control	Y8	Continuous variable, 1-8
Environmental understanding	Y9	Continuous variable, 1-6

(4) Cross analysis of government subsidies and willingness to pay

First the age factor of the respondents. As shown in Table 2, in the "1" stage of subsidy intensity, the minimum value is 20, and the average age is higher on both sides. Therefore, the slope changes significantly at "1". Similarly, the average age corresponding to the subsidy intensity "7 and 8" is "58.4 and 61.3", and the age is greater than the subsidy intensity "5 and 6". Previous studies have shown that the willingness to pay decreases with age, so the "7 ~ 8" stage. Second, it may be due to the sample size. Due to the small sample size of "7 and 8" subsidies, there is a certain error in the obtained data.

Table 2

Distribution of age groups under different government subsidies

Government subsidies	Mean value [-]	Sample size [-]	Standard deviation [-]	Minimum value [-]	Maximum value [-]
0	56.3	166	1.44	10	80
1	63.2	123	1.78	20	80
2	55.6	145	1.33	10	80
3	50.3	122	1.85	10	80
4	52.3	117	1.56	10	80
5	45.8	78	1.88	10	80
6	46.5	88	1.34	20	80
7	58.4	18	1.55	20	80
8	61.3	10	1.43	20	80

Moreover, with the improvement of the government's environmental protection publicity and education, farmers' willingness to pay increases in the same direction, and the growth rate becomes larger.

As a rational economic men, farmers will make behavioural decisions through all aspects of comprehensive income. The implementation of policies and relevant measures by the government will have an impact on the domestic sewage discharge behaviour of farmers. Input the variables such as government supervision, government subsidies, and environmental protection publicity and education into Statistical Product and Service Solutions (SPSS). After linear regression calculation, the results are shown in Tables 3 and 4.

Table 3

Domestic sewage discharge inspection

Model	Sum of squares [-]	*df* [-]	Mean square [-]	F [-]	Sig. [-]
Regression	38.334	4	12.445	73.332	0.000
Residual	108.223	569	0.186	-	-
Total	145.321	556	-	-	-

Table 4

Coefficient of domestic sewage discharge behaviour model

-	Non standardised coefficient, B [-]	Standard deviation [-]	Standard coefficient, β [-]	t [-]	Sig. [-]
Constant	0.285	0.024	-	7.223	0.000
Government supervision	0.015	0.015	0.027	0.965	0.245
Government subsidies	0.156	0.011	0.452	12.443	0.001
Publicity of laws and regulations	0.056	0.213	0.078	2.565	0.025

As shown in the standard $p - p$ diagram of standardised residuals, the residuals show normal distribution and meet the regression requirements. It can be seen from Table 3 that sig is 0.000, which is significant at the 1 % level, indicating that there is a significant correlation between dependent variables and independent variables in the model as a whole. In the model coefficients in Table 4, from the coefficient B, when the government supervision, government subsidies and laws and regulations publicity and education increase, farmers' discharge of domestic sewage will be more standardised. As shown in the standard coefficient column, the strength of government supervision, government subsidies and laws and regulations publicity and education are 0.027, 0.452 and 0.078 respectively, and the standard coefficient of government subsidies is β. It is 0.452, which is the largest among the three variables, indicating that the government subsidy has the greatest impact on Farmers' sewage discharge behaviour, and the standard coefficient of government supervision β Minimum impact.

Conclusion

This study takes the causes and current situation of household pollution as the starting point and comprehensively considers the cost-effectiveness and technical feasibility of household pollution control measures. Providing scientific decision-making basis for the government to formulate rural domestic pollution control policies has practical and theoretical significance for improving the theory and research methods of rural non-point source pollution control and management in China. At the same time, a systematic study of the government's administrative intervention mechanism in rural environmental governance can promote the construction of a rural ecological environment and the development of a harmonious society.

Taking Zhejiang Province as the research object, this paper deeply analysed the types, current situation, and causes of rural environmental pollution in Xijiang. It puts forward practical solutions for the root causes of pollution. Taking Huzhou as an example, this paper analysed it based on CVM. Cross analysis shows that the greater the government subsidy and publicity, the more willing farmers are to pay.

This paper puts forward that to speed up the governance of the rural environment, and we must strengthen the function of the government in rural environmental governance.

The government should improve the environmental protection consciousness of leaders at all levels and the masses, enrich farmers' environmental governance knowledge and technical training, make full use of the market mechanism, and increase environmental protection investment in many aspects; Improve the government's environmental protection mechanism and clarify the government's functions; Accelerate the transformation of government functions and accelerate the improvement of rural environmental governance.

Acknowledgements

Supported by major projects of National Social Science Foundation of China Study and explain the spirit of the Fifth Plenary Session of the 19th CPC Central Committee (21ZDA028) "Construction of ecological friendly water environment management system in new rural areas of socialist modernisation pilot area".

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